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HIRI NEWS

HEAT ISLAND REDUCTION INITIATIVE

Results from the Philadelphia ECA's Cool Homes Program, Overview of the Pacific Southwest Urban Research Center Projects, Chicago Energy Code Amendments, and More!

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Philly Cool Homes Update

Liz Robinson, Executive Director of the Philadelphia Energy Coordinating Agency (ECA), spoke to call participants about the city's Cool Homes program and discussed results to date. Liz said the program was initiated to deliver energy conservation services – including cool roofs – to low income and elderly residents. With 165,000 people in these categories, and with several major heat waves over the last several years, ECA's cool homes program represents an important mitigation strategy. To date, the Cool Homes program has installed over 450 cool roofs along with other weatherization and conservation treatments.

Liz discussed results from a program analysis conducted by M. Blasnik & Associates. Their work is based on temperature and humidity observations collected with data logger at 35 houses. Six of the houses were logged in the summer 2001 and treated before the summer of 2002. Six other homes were designated for the comparison group and did not receive treatment during the summer. This left 23 houses with potential for short-term pre/post analysis.

According to the report, "the temperature data is showing clear patterns of program impacts consistent with expectations." In-field observations show that white roof coatings and R-38 insulation nearly eliminate the impact of solar heat gain through the roofs in the target houses. Liz noted that indoor ceiling-height temperatures were reduced by about 5° F on hot days and chest-height bedroom air temperatures declined by about half that amount.

The heat gain from the ceiling was reduced by approximately 80% as ceiling temperatures dropped to within half a degree of 2nd floor indoor air temperatures. This means that the largest single source of heat gain to most flat roof row houses – the roof system – is largely neutralized. Interestingly, the analysis determined that the impacts on ceiling temperatures were almost as large in houses with air conditioning as those without. The impacts on air temperatures in homes with A/C were also substantial despite the use of air conditioners before and after treatment.

The report concludes that all analyses performed supports the conclusion that the roof coating has worked as expected. However, the impacts of the program-measures on occupant health, comfort, and energy usage is still being analyzed.

During the call, Liz addressed a question about whether the observed results were primarily the result of cool roofs or the insulation treatment that accompanies roof installation. She said preliminary results suggest the coatings provide most of the interior cooling benefit, but that both treatments are important. Liz said more research still needs to be done in this area.

Another topic on the call was preliminary results from the exterior data loggers. They suggest that city blocks with reflective rooftops can be slightly cooler in summertime than surrounding areas.

Because the Philadelphia Cool Homes program provides an important model for other cities, it's goals are worth reiterating. They are to reduce indoor temperatures to a comfortable level, minimize health risks, stabilize energy consumption, and provide social interaction and outreach to seniors.

For more information, see: http://www.ecasavesenergy.org/

Center for Urban Forest Research UHI Work

Dr. Greg McPherson, Director of the Center for Urban Forest Research, joined the call to talk about his work and how tree planting can be an effective heat island mitigation strategy. Greg said that the purpose of the Center is to find new ways for urban forests to add value to communities. This is typically accomplished by stating research results in financial terms.

The presentation started with an explanation of how trees influence energy use. This occurs as follows: trees influence intermediate climate effects, including the amount of solar radiation that hits the ground, air temperatures, and wind speed. These climate impacts, in turn, affect the energy demanded for cooling electricity and heating, thereby impacting air quality and carbon dioxide emissions. Greg pointed out that direct energy savings from trees depends on their location from the building, size, crown density, shape, and

leaf patterns. The Center provides shade tree planting guidelines that address these factors.

Slide 9 in Greg's presentation illustrates another major factor in determining potential energy savings from trees: location within the US. Residents and building owners in Southwest cities, in particular, stand to gain from strategic planting. A study at the Center is currently looking at the effects of "California's Urban Forests on Energy Use." Even within the state, results suggest a wide range of potential energy savings based on location. The study predicts increasing savings in annual electricity consumption over time as more trees are planted and existing trees mature. It suggests that, within California, the south- and mid-central valley areas, and the high dessert, have the greatest potential for kWh saved per residential tree planted after 15 years. These areas are also where shade tree programs can be most cost-effective.

In addition to energy savings, Greg touched on the air quality and carbon benefits of trees. These occur via direct pollutant uptake, avoided emissions from power plants, and carbon sequestration. In addition to the pollutant removal mechanism, Greg noted that trees are also a source of biogenic VOCs. The Center's guidelines on tree location and selection can be used to calculate savings from tree planting programs and to maximize related benefits.

Slide 20 discusses EnergyWise, a new software tool for strategic shade tree planting. EnergyWise optimizes energy savings via tree location and selection, and provides information on heating and cooling loads and costs. The software also helps evaluate the benefits of parking lot vegetation. Preliminary results suggest that there are substantial cooling benefits – trees can make lots up to 3 degrees cooler, cabin space 20-25 degrees cooler and gas tanks 2-4 degrees cooler. Five percent shading can result in a one ton/day VOC reduction.

The Center has also been doing research in Sacramento to evaluate the effectiveness of the city's shade tree planting ordinance for parking lots. Greg said that while the specification requires 50% shade, only 22% has been realized 15 years after the ordinance was first passed. He estimates that it would cost an additional $20 M to reach the 50% target. The Center's recommendations for cities interested in pursuing a strategy similar to Sacramento's is to use ordinances, education (and enforcement), and demonstration projects.

For more information, see: http://wcufre.ucdavis.edu/index.html

Two related papers from the Center on parking lot shade can be downloaded here: http://wcufre.ucdavis.edu/products/11/cufr_69.pdf, http://wcufre.ucdavis.edu/products/11/cufr_68.pdf

Cool Roof Amendment to Chicago's Energy Conservation Code

Gerry Bakker, of the City of Chicago Department of Environment, joined the call to discuss revisions to the city's Energy Conservation Code relevant to heat island mitigation. The amendments address the city's explicit goal of reducing the urban heat island effect through the mandatory use of cool roofs on all new and renovated low-slope roofs. Gerry said they are also consistent with Chicago's goal of becoming one of the greenest cities in the country.

Gerry noted that throughout the standard-setting process, his office worked with the local roofing industry to assure their necessary cooperation with the amendment. In addition to health benefits, the City believes the provisions on roof reflectance will be cost-effective for building owners, especially when viewed from a long-term perspective.

The code states that for low-slope roofs, "Roofs installed prior to and including 12/31/08 shall have a minimum solar reflectance, both initial and weathered, of 0.25," and that, "Roofs installed after 12/31/08 shall utilize roofing products that meet or exceed the minimum criteria to qualify for an Energy Star label as designated by the USEPA Energy Star program."

The methods used to evaluate code compliance, according to the amendment, are American Society of Testing and Materials (ASTM) E903, ASTM E 1918 (or, alternatively, testing with a portable reflectometer at near ambient conditions).

The interim reflectance standard of 0.25 that is now in place through 12/31/08 replaces a stepladder approach to reaching the 0.65 Energy Star standard by 2009, and was agreed upon in consultation with the local roofing industry. A related proposal to pass a reflectance standard of 0.15 for steep sloped roofs (typical of the residential sector) faced opposition from industry. Chicago is working with the roofers to see if a compromise can be reached.

It is also worth noting that the standard offers exemptions to the low-slope standard to

accommodate green roofs and solar panels. It says, "The portion of the roof that is covered by a... rooftop garden, or a green roof, is exempted from the requirements of this section," and that, "An area including and adjacent to rooftop photovoltaic and solar thermal equipment, totaling not more than three times the area that is covered with such equipment, may be exempted from the requirements of this section."

For more information, see: http://www.cityofchicago.org/Buildings/BuildingCode/AmendDigest.pdf

The next conference call is TBD. Stay tuned for the date, call-in number, and access code.